VIVEKANANDA COLLEGE
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NAAC ACCREDITED 'A' GRADE

Topic: Study of specimens under Phylum Arthropoda

Course Title: Non-Chordates II

Paper: CC-3

Unit: Laboratory Course

Semester: 2

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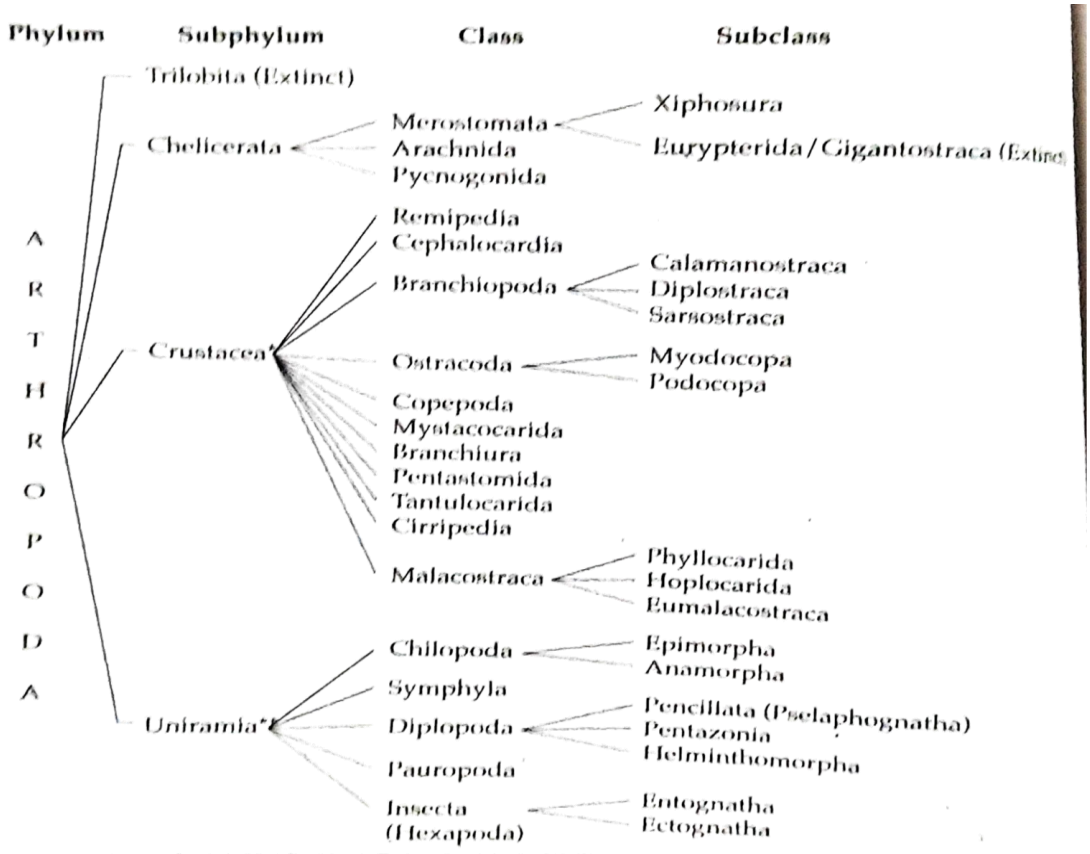
The Phylum Arthropoda (Gk: *arthron*, joint; *podos*, feet) includes the largest number of animals. In the course of evolution, the arthropods appeared much earlier and were the first to dominate the land. They have tremendous adaptive diversity that has enabled them to survive virtually in every habitat.

General characters:

1. Segmented body with bilateral symmetry.
2. Anterior segments specialized to form a distinct head.
3. A pair of externally jointed appendages is usually present in each segment.
4. Body is externally covered with a thick, non-living chitinised cuticle forming the exoskeleton.
5. Exhibit a process called moulting or ecdysis, whereby the old exoskeleton is shed off and a new one develops from the underlying epidermis.
6. Presence of thin, flexible, soft arthroidal membrane containing the segments of exoskeleton.
7. Presence of musculature with distinct striped muscles.
8. Body cavity is haemocoel.
9. Mouth and anus are located at the two terminal ends of the body.
10. Circulation is of open type, i.e. blood vessels open within haemocoel.
11. Central nervous system includes a dorsally placed brain or cerebral ganglionic mass connected to two ventral nerve cord with segmental ganglia.
12. Usually possess compound eyes.
13. Sexes are generally separate with occurrence of sexual dimorphism.
14. Development may be direct or indirect.

Classification:

According to Ruppert and Barnes, 1994



Specimen 1:

Systematic position: (According to Ruppert and Barnes, 1994)

Phylum Arthropoda
Sub phylum Chelicerata
Class Merostomata
Sub class Xiphosura

Pt. nos. 3, 4, 6, 9

Hence, the specimen belongs to Phylum Arthropoda

1. Body divided into an anterior cephalothorax or prosoma and a posterior abdomen or opisthosoma.
2. Prosoma bears six pairs of appendages.
3. First two pairs of appendages are chelicerae and pedipalpi.

Hence, the specimen belongs to Sub phylum Chelicerata

1. Opisthosoma is divided into seven segmented mesosoma and a five segmented metasoma.
2. Mesosoma bears 5 or 6 pairs of biramous, lamelliform appendages.
3. A prominent spike like caudal spine or telson is present at the end.

Hence, the specimen belongs to Class Merostomata

1. Prosoma and opisthosoma is divided by a hinge.
2. Abdominal segments fused and bears six pairs of appendages.
3. Elongated and pointed caudal spine.

Hence, the specimen belongs to Sub class Xiphosura

1. Prosoma has an unsegmented horse-shoe shaped carapace with bent edges.
2. Carapace has one median and two lateral ridges.
3. Opisthosoma has serrated edges and contains six pairs of movable spines.
4. Caudal spine is hinged and freely movable.

Hence, the specimen seems to be *Limulus* sp. (King crab)

Specimen 2:

Systematic position: (According to Ruppert and Barnes, 1994)

Phylum Arthropoda
Sub phylum Crustacea
Class Malacostraca
Sub class Eumalacostraca

Upto Phylum Arthropoda same as Specimen 1

1. Head and thorax fused to form cephalothorax.
2. Head bears a pair of compound eyes, sometimes located on movable stalks.
3. Head bears five pairs of appendages which comprise of two pairs of antennae, one pair of mandibles and two pairs if maxillae.

Hence, the specimen belongs to Sub phylum Crustacea.

1. Thorax has eight and abdomen has six or seven segments.
2. All the fourteen segments bear appendages.
3. The posterior thoracic limbs are walking legs and the first five pairs of abdominal ones form swimming organs (pleopods)

Hence, the specimen belongs to Class Malacostraca.

1. Abdomen with six segments.
2. Caudal style absent.

Hence, the specimen belongs to Sub class Eumalacostraca.

4. Cephalothorax is large, unsegmented and covered by dorsal shield that further consists of anterior dorsal plate and posterior carapace
5. The dorsal plate extends forward as the rostrum
6. Upper margin of the rostrum has 10-12 teeth of which 3 is on carapace
7. Cephalothorax is formed by union of 5 heads and 8 thoracic segments
8. Abdomen consists of 6 distinct movable segments and a terminal conical telson
9. Cephalic appendages are a pair each of antennules, antenna, mandible, maxillulae and maxillae
10. Abdomen bears 6 pairs of biramous pleopods

Hence, the specimen seems to be *Palaemon* sp.

Specimen 3:

Systematic position: (According to Ruppert and Barnes, 1994)

Phylum Arthropoda
Sub phylum Crustacea
Class Cirripedia

Upto Phylum Arthropoda same as Specimen 1

Upto Sub phylum Crustacea same as Specimen 2

1. Body is poorly segmented and most lack an abdomen
2. Carapace is folded.
3. Body is protected by hard calcareous plates.
4. Six pairs of biramous filamentous thoracic appendages are present.

Hence, the specimen belongs to Class Cirripedia.

1. Scutum and tergum support the valvular carapace.
2. Membranous preoral surface is modified for attachment.
3. Six calcareous plates surround the body.
4. Six pairs of thoracic legs protrude out through the opening of the carapace.

Hence, the specimen seems to be *Balanus* sp. (Acorn barnacle/Rock Barnacle)

Specimen 4:

Systematic position: (According to Ruppert and Barnes, 1994)

Phylum Arthropoda
Sub phylum Crustacea

Class Malacostraca
Sub class Eumalacostraca

Upto Phylum Arthropoda same as Specimen 1

Upto Sub class Eumalacostraca same as Specimen 2

1. Body is elongated and asymmetrical.
2. First thoracic leg is chelate known as great chela, the rest are reduced.
3. Abdominal appendages are reduced on left side and absent on the right side.
4. Uropods are hook like

Hence, the specimen seems to be *Eupagurus* sp. (Hermit crab)

Specimen 5:

Systematic position: (According to Ruppert and Barnes, 1994)

Phylum Arthropoda
Sub phylum Uniramia
Class Chilopoda
Sub class Epimorpha

Upto Phylum Arthropoda same as Specimen 1

1. Body divided into head and trunk.
2. Trunk either bears pairs of walking legs, or it may be differentiated into thorax and abdomen.
3. Appendages uniramous.
4. Head appendages comprise of a pair each of antennae, mandibles and maxillae and an upper lip or labrum.

Hence, the specimen belongs to Sub phylum Uniramia.

1. Body is elongated and dorsoventrally flattened.
2. Trunk comprises of 15 to more than 181 leag-bearing segments, the last two segments being legless.
3. First trunk segments are modified as poison claws or maxillipedes.
4. Mouth parts include include mandibles and two pairs of maxillae.

Hence, the specimen belongs to Class Chilopoda.

1. Adults possess 21 or more pairs of legs.
2. Brooding of eggs takes place.

Hence the specimen belongs to Sub class Epimorpha.

1. Antennae are filliform.
2. Tergites are equal in size.
3. Walking legs are seven-jointed.
4. Last apodal segment has anus.

Hence, the specimen seems to be *Scolopendra* sp. (Centipede)

Specimen 6:

Systematic position: (According to Ruppert and Barnes, 1994)

Phylum Onychophora

1. Presence of thin cuticle on body surface.
2. Head consists of three segments, one preoral and two post oral.
3. Presence of many stumpy, unjointed clawed appendages.

Hence, the specimen belongs to Phylum Onychophora.

1. Caterpillar-like body has many transverse rows of fine papillae.
2. Preoral segment bears a pair of preantennae.
3. Postoral segments bear jaws and oral papillae.
4. All trunk segments are identical.
5. Distal ends of trunk appendages bear spinose pads and two recurved claws.

Hence, the specimen seems to be *Peripatus* sp. (Velvet worm)

Specimen 7:

Systematic position: (According to Ruppert and Barnes, 1994)

Phylum Arthropoda

Sub phylum Uniramia

Class Insecta

Sub class Ectognatha

Upto Phylum Arthropoda same as Specimen 1

Upto Sub phylum Uniramia same as Specimen 5

1. Body is divided into head, thorax and abdomen.
2. Thorax bears three pairs of jointed walking legs and usually two pairs of wings.
3. Abdomen mostly has eleven segments without walking legs.

Hence, the specimen belongs to Class Insecta.

1. Mouth parts are not sunk into a pouch.
2. Presence of compound eyes.
3. Presence of an ovipositor derived from the eighth and ninth abdominal segments.

Hence, the specimen belongs to Sub class Ectognatha

1. Small like a pin head and remain attached to some object.
2. Colour is creamy white or yellow.
3. Presence of micropyle at the anterior end.

Hence, the specimen seems to be the egg of silk moth.

1. Body is elongated and divisible into head, thorax and elongated abdomen..
2. Thorax is 3-segmented, each bearing a pair of jointed legs.
3. Prothorax has a pair of spiracles on the lateral sides.
4. Abdomen has eleven segments with 8 pairs of spiracles, 4 pairs of abdominal legs, a pair of caudal legs and one caudal horn.

5. In males, a spot called Herold's imaginal bud and in females, a pair of spots called Ishiwata's buds are situated on the ventral side between 8^{th} and 9^{th} segments.

Hence, the specimen seems to be larva of silk moth.

1. Covered by a hard shell formed of continuous silk thread.
2. Presence of imaginal buds, like a pair of compound eyes, a pair of antennae, two pairs of wings and three pairs of thoracic legs.
3. Presence of 7 pairs of spiracles on ventro-lateral sides of abdomen.

Hence, the specimen seems to be pupa of silk moth.

1. Entire body and wings are covered with minute scales and hairs.
2. Antennae are bipectinate type with 35-40 small segments.
3. Presence of six pairs of spiracles on the abdomen.
4. The abdomen consists of eight segments in male, and seven segments in female.
5. The tibia has one spur in female and two spurs in male.

Hence, the specimen seems to be adult silk moth.

Specimen 8:

Systematic position: (According to Ruppert and Barnes, 1994)

Phylum Arthropoda
Sub phylum Uniramia
Class Insecta
Sub class Ectognatha

Upto Phylum Arthropoda same as Specimen 1

Upto Sub phylum Uniramia same as Specimen 5

Upto Class Insecta and Sub class Ectognatha same as Specimen 7

1. Body divided into head, thorax and abdomen.
2. Small white wingless form
3. Mandibles powerful and head directed downwards with small red jaws.

Hence, the specimen seems to be worker of a termite colony.

1. Large and strong head with sclerotized jaws placed ventrally in front of head.
2. Head contains long mandibles, maxilla, antennae and compound eyes.

Hence, the specimen seems to be mandibulate soldier of a termite colony.

1. Head with a medial frontal rostrum (nasus), antennae and compound eyes.
2. Mandibles are small and vestigial.

Hence, the specimen seems to be nasute soldier of a termite colony.

1. Body is divided into head, thorax and enormously distended abdomen.
2. Head bears one pair of compound eyes and one pair of antennae.
3. Presence of wing stubs with prominent basal sutures.
4. Tarsi are 4-segmented with a pair of claws.

Hence, the specimen seems to be Termite queen.

Specimen 9:

Systematic position: (According to Ruppert and Barnes, 1994)

Phylum Arthropoda
Sub phylum Uniramia
Class Insecta
Sub class Ectognatha

Upto Phylum Arthropoda same as Specimen 1

Upto Sub phylum Uniramia same as Specimen 5

Upto Class Insecta and Sub class Ectognatha same as Specimen 7

1. Small bees with well developed and powerful wings.
2. Presence of wax glands on the ventral side of the abdomen.
3. Hind legs or metathoracic legs bear a pollen basket.
4. Mandibles well developed.
5. A full-fledged sting is present in the last abdominal segment.

Hence, the specimen seems to be worker of a honey bee colony.

1. Body is black in colour.
2. Larger in size than workers, with powerful wings.
3. Have greatly enlarged eyes, which cover most of the head.
4. Abdomen is blunt and flat.

Hence, the specimen seems to be drone of a honey bee colony.

1. Size is comparatively larger than other members.
2. Wings are smaller than its body.
3. Abdominal end gradually tapers.
4. Presence of a curved and barbless sting at the posterior end of the body.

Hence, the specimen seems to be queen of a honey bee colony.